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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/557,108	04/24/2000	Jiang Hsieh	15-CT-5344	8980

7590 05/29/2003

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EXAMINER

KIM, CHONG R

ART UNIT	PAPER NUMBER
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2623

DATE MAILED: 05/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/557,108

Applicant(s)

HSIEH, JIANG

Examiner

Charles Kim

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 March 2003.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 9, 11-13, 15-21, 23 and 25-27 is/are rejected.
- 7) ☒ Claim(s) 8, 10, 14, 22, 24, 28 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 April 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment and Arguments

1. Applicant's amendment filed on March 14, 2003 has been entered and made of record.
2. Applicant's arguments have been fully considered, but they are not deemed to be persuasive for at least the following reasons.

Applicants argue (page 3) that the provisional obviousness-type double patenting rejection is improper because claim 1 of co-pending U.S. Patent Application No. 09/429,867 has not issued in a U.S. Patent. The Examiner responds by pointing out that a provisional obviousness-type double patenting rejection was issued because the conflicting claims have not in fact been patented, see MPEP 804.

Applicants further argue (page 4) that their claimed invention (claim 1) differs from the prior art because "Taguchi et al. does not describe or suggest a method including the steps of 'estimating a projection at a plane of reconstruction of the object using the attenuation measurements of the object, including the more than two conjugate samples, and filtering and backprojecting the attenuation measurements of the object, including the more than two conjugate samples, to reconstruct at least one image slice of the object'". The Examiner disagrees. As noted in the previous office action, Taguchi teaches the step of acquiring attenuation measurements of the object, the measurements including more than two conjugate samples for estimation of a projection at a plane of reconstruction of the object. Taguchi explains that two data samples can be selected from a group of data for estimating a projection at a plane of reconstruction of the object (col. 5, lines 1-9). Note that the projection of the object is

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estimated using Taguchi's group of data (more than two samples), wherein two samples are selected from the group of data. Furthermore, Taguchi does not limit the number of samples that can be selected for estimating the projection. For example, Taguchi teaches the step of estimating a projection at a plane of reconstruction of the object using the attenuation measurements of the object, including the more than two conjugate samples, (col. 11, lines 48-60 and figure 15). Taguchi explains that the interpolated data is determined using more than two $(2n+1)$ samples, wherein the interpolated data is supplied to the image reconstructor in order to reconstruct (project) the image (col. 12, lines 22-25).

Applicants further argue (page 7) that the section 103 rejections were not proper because "there is no motivation to combine the references (Taguchi and Berlad)". The Examiner disagrees. Taguchi explains that the interpolation method comprises well known non-linear interpolation techniques (Taguchi, col. 3, lines 10-13), but fails to teach a Lagrange interpolation. However, Lagrange interpolation techniques were exceedingly well known in the art. For example, Berlad teaches a non-linear Lagrange interpolation technique, as noted in the previous office action. Taguchi and Berlad are both concerned with reconstructing radiation images by applying an interpolation step. Berlad explains that the non-linear Lagrange interpolation technique minimizes texture artifacts, thereby producing an accurate interpolated image (Berlad, col. 4, lines 25-44). The ordinary artisan would have been motivated to combine the teachings of Taguchi and Berlad in order to reconstruct a radiation image based on an accurate interpolated image, thereby enhancing the resultant radiation image and improving diagnosis. Therefore, it would have been obvious to combine the teachings of Taguchi and Berlad so that the non-linear interpolation of Taguchi is a non-linear Lagrange interpolation, as taught by Berlad.

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In response to applicant's argument (page 7) that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). In this case, we take into account the knowledge from Taguchi, who teaches that the interpolation method comprises well known non-linear interpolation techniques, and the knowledge from Berlad, who teaches that the non-linear Lagrange interpolation techniques minimizes texture artifacts, thereby producing an accurate interpolated image. Therefore, the knowledge taken into account from both Taguchi and Berlad are considered to be within the level of ordinary skill, and therefore does not include knowledge gleaned only from the applicant's disclosure.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

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3. Claims 1-5, 9, 11, 15-19, 23, 25 are rejected under 35 U.S.C. 102(e) as being anticipated by Taguchi (U.S. Patent No. 5,974,108).

Referring to claim 1, Taguchi discloses a method for imaging an object with a computed tomographic imaging system, comprising the steps of:

- a. helically scanning the object with a multi-slice CT imaging system to acquire attenuation measurements of the object, the measurements including more than two conjugate samples (col. 4, line 61 to col. 5, line 9. Note that the “groups of real data” in col. 5, line 6 is interpreted as being analogous to more than two conjugate samples; since two data samples are selected from the group, see col. 5, lines 4-6)
- b. estimating a projection at a plane of reconstruction of the object using the attenuation measurements of the object, including the more than two conjugate samples [col. 11, lines 48-60 and figure 15. Taguchi explains that the interpolated data is determined using more than two $(2n+1)$ samples, wherein the interpolated data is supplied to the image reconstructor in order to reconstruct (project) the image (col. 12, lines 22-25)]
- c. filtering and backprojecting the attenuation measurements of the object, including the more than two conjugate samples, to reconstruct at least one image slice of the object [col. 25, lines 1-12 and col. 26, lines 19-21. Note that the filtering is performed in the interpolator (29) and the backprojecting is performed in the image reconstructor (31) of figure 11].

Referring to claim 2, Taguchi further discloses that the more than two conjugate samples are located within a predetermined distance from the plane of reconstruction of the object [col. 2, lines 23-29. Note that the “target slicing location” in line 27 is interpreted to mean the plane of reconstruction, since the image is produced at that location, col. 6, lines 28-30. It is also noted

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that the samples (arrows) are located within a predetermined distance from the plane of reconstruction (target slicing location) in figure 4B].

Referring to claim 3, Taguchi further discloses that the CT imaging system has N detector rows (col. 14, line 66), and further comprises the step of selecting a helical pitch $P:1$ for the helical scan, where P is a non-integer less than N (col. 15, line 33. Note that $N=4$ and a helical pitch of 2.5 is selected).

Referring to claim 4, Taguchi further discloses that $N=4$ and $P=2.5$ (col. 14, line 66 and col. 15, line 33 and figure 26).

Referring to claim 5, Taguchi further discloses a step of applying a non-linear interpolation to the attenuation measurements prior to the filtering and backprojecting (col. 24, lines 34-45 and figure 45).

Referring to claim 9, Taguchi further discloses that applying a non-linear interpolation to the attenuation measurements comprises combining weighted interpolated measurements with weighted extrapolated measurements (col. 11, lines 20-28 and col. 12, lines 12-20).

Referring to claim 11, Taguchi further discloses the step of applying a set of weights to the attenuation measurements prior to the filtering and backprojecting (col. 10, lines 45-57. Note that the weights are applied as the interpolation proceeds in lines 45-46, and is therefore applied prior to the filtering and backprojecting; since the interpolation is applied prior to the filtering and backprojecting as disclosed above).

Claims 15-19, 23, 25 recite a system that corresponds to the method of claims 1-5, 9, 11. Arguments analogous to those presented above with respect to claims 1-5, 9, 11 are applicable to claims 15-19, 23, 25. The system for performing Taguchi's method is inherent in his teaching.

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Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 6-7, 12-13, 20-21, 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taguchi (U.S. Patent No. 5,974,108), further in view of Berlad (U.S. Patent No. 5,513,120).

Referring to claim 6, Taguchi fails to teach applying a Lagrange interpolation.

Berlad teaches a step of applying a Lagrange interpolation to a radiation image (col. 4, lines 1-19).

Taguchi and Berlad are both concerned with reconstructing radiation images by backprojection. Berlad's method provides an interpolated image where the texture of the image does not vary as a function of location and the signal content and signal-to-noise ratio are substantially the same after the interpolation (Berlad, col. 2, lines 16-29). Berlad further explains that the non-linear Lagrange interpolation technique minimizes texture artifacts, thereby producing an accurate interpolated image (Berlad, col. 4, lines 25-44). The ordinary artisan would have been motivated to combine the teachings of Taguchi and Berlad in order to construct a radiation image based on an accurate interpolated image, thereby enhancing the resultant radiation image and improving diagnosis. Therefore, it would have been obvious to modify the interpolation of Taguchi so that it is a Lagrange interpolation, as taught by Berlad.

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Referring to claim 7, Taguchi teaches applying a non-linear interpolation to the attenuation measurements from four detector rows (col. 14, line 66 and col. 24, lines 34-45). Taguchi fails to teach applying a third order Lagrange interpolation weights to the measurements.

Berlad teaches the step of applying third order Lagrange interpolation weights to a radiation image (col. 4, lines 48-50. Note that the “four interpolation coefficients as derived from a four point cubic Lagrange polynomial” in lines 48-50 is interpreted to mean third order Lagrange interpolation weights).

Taguchi and Berlad are both concerned with reconstructing radiation images by backprojection. Berlad’s method provides an interpolated image where the texture of the image does not vary as a function of location and the signal content and signal-to-noise ratio are substantially the same after the interpolation (Berlad, col. 2, lines 16-29). Berlad further explains that the non-linear Lagrange interpolation technique minimizes texture artifacts, thereby producing an accurate interpolated image (Berlad, col. 4, lines 25-44). The ordinary artisan would have been motivated to combine the teachings of Taguchi and Berlad in order to construct a radiation image based on an accurate interpolated image, thereby enhancing the resultant radiation image and improving diagnosis. Therefore, it would have been obvious to modify the interpolation applying step of Taguchi, so that it applies third order Lagrange interpolation weights, as taught by Berlad.

Referring to claim 12, Taguchi fails to teach the step of applying Lagrange weights to the attenuation measurements.

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Berlad teaches the step of applying Lagrange weights to a radiation image (col. 48-50.

Note that the “four interpolation coefficients” in line 48 is interpreted to mean Lagrange weights).

Taguchi and Berlad are both concerned with reconstructing radiation images by backprojection. Berlad’s method provides an interpolated image where the texture of the image does not vary as a function of location and the signal content and signal-to-noise ratio are substantially the same after the interpolation (Berlad, col. 2, lines 16-29). Berlad further explains that the non-linear Lagrange interpolation technique minimizes texture artifacts, thereby producing an accurate interpolated image (Berlad, col. 4, lines 25-44). The ordinary artisan would have been motivated to combine the teachings of Taguchi and Berlad in order to construct a radiation image based on an accurate interpolated image, thereby enhancing the resultant radiation image and improving diagnosis. Therefore, it would have been obvious to modify the set of weights of Taguchi, so that they are Lagrange weights, as taught by Berlad.

Referring to claim 13, see the rejection of at least claim 7 above.

Claims 20-21, 26-27 recite a system that corresponds to the method of claims 6-7, 12-13. Arguments analogous to those presented above with respect to claims 6-7, 12-13 are applicable to claims 20-21, 26-27. The system for performing Taguchi and Berlad’s method is inherent in their teaching.

Allowable Subject Matter

5. Claims 8, 10, 14, 22, 24, and 28 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. Edic U.S. Patent No. 6,353,653 discloses a method for estimating a projection of an object in a CT radiographic image by using more than two data samples.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Charles Kim whose telephone number is 703-306-4038. The examiner can normally be reached on Monday thru Thursday 8:30am to 6:00pm and alternating Fridays 9:30am to 6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on 703-308-6604. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9314 for regular communications and 703-872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-0377.

ck

May 28, 2003


Jon Chang
Primary Examiner